

Mathematics 2002 Performance Definitions

High School

Basic Level

Students who scored at the “Basic” level demonstrated minimal evidence of their understanding of the grade-level appropriate mathematical content in the Michigan Curriculum Framework. Such evidence was exhibited by, but was not limited to, students:

Apply basic concepts, algorithms, properties, and procedures to solve simple one-step problems presented in a real-world context.

- Demonstrate partial understanding of rational and irrational numbers.
- Apply fluent computation with rational numbers with minimal errors.
- Use familiar strategies to solve multi-step problems, but cannot change or adapt strategies to new situations.
- Generalize a pattern for simple arithmetic/geometric sequences.
- Recognize algebraic properties but cannot always apply correctly.
- Set up and solve simple linear equations.
- Recognize and identify the basic characteristics of parent functions (linear, quadratic/exponential/absolute value) and their families.
- Apply and use fundamental geometric properties correctly.
- Demonstrate a partial understanding of the properties of two- and three-dimensional shapes.
- Distinguish between random and nonrandom situations, calculate elementary probabilities, choose and use correct formula(s) for a given problem (including the fundamental counting principle).

Use appropriate tools (such as tables, charts, graphs, compasses, protractors, and /or formulas) to obtain mathematical information.

- Create correct graphs and tables, but indicate some difficulty in choosing the appropriate one.
- Measure accurately using tools (e.g., protractor, ruler).
- Collect and organize data from a random sample of a population and provide limited analysis.
- Demonstrate incomplete understanding and use of units of measurement for distance and area.
- Use simple formulas correctly.
- Use tools (e.g., graphs, tables, calculators) to recognize and interpret information.
- Demonstrate limited understanding of the distinction between exactness and approximation, precision and accuracy, and tolerance.

- Show proficient use of scientific calculators and use of basic functions on graphing calculators.

Generate minimal written responses to questions.

- Read and use essential math vocabulary.
- Attempt a reasonable response to completely answer the question.
- Construct simple, logical arguments; but complex arguments are incomplete and may include unfounded inferences.

Recognize examples and applications of mathematical ideas.

- Show limited ability to evaluate correctness of answers to routine problems.
- Provide examples or explanations with occasional errors.
- Produce a basic narrative to explain the steps used to solve a problem.
- Demonstrate limited ability to understand and use mathematical, symbolic language.
- Show limited ability to make connections between classroom knowledge and real-world contexts.

Met Level

Student who scored at the “Met” level consistently applied grade-level appropriate, integrated procedural knowledge and conceptual understanding to solve problems consistent with the mathematical content in the Michigan Curriculum Framework. Such evidence was exhibited by, but was not limited to, students:

Apply basic concepts, algorithms, properties, and procedures to solve multi-step, routine problems.

- Demonstrate basic understanding of rational and irrational numbers.
- Set up and solve simple quadratic equations.
- Produce and use strategies to solve multi-step problems, can adapt strategies (flexible) to new situations, if necessary.
- Apply fluent use of algebraic properties (e.g., commutative, distributive, property of equality).
- Apply the formula for arithmetic/geometric sequences.
- Extend understanding of parent functions to inverse, piecewise, logarithmic, trigonometric, power, and circular functions
- Apply and use geometric principles/properties correctly (e.g., triangle, angles, transformations, trigonometric ratios, perimeter /area/volume, similarity/congruence).
- Apply routine concepts of probability and combinatorics (e.g., randomness, sampling, counting, independent and dependent events).
- Design simple probability simulations.

Use appropriate tools (such as tables, charts, graphs compasses, protractors, and /or formulas) to obtain and interpret mathematical information.

- Collect, analyze, interpret and display data.
- Recognize the differences between statistical and algebraic graphs.
- Determine suitable charts and graphs for various types of data (e.g., circle, line, bar, scatter plot, box).
- Analyze the spread, shape, and display of the data.
- Critique the mathematical correctness of the collection and use of data.
- Select and apply appropriate formulas.
- Translate problems into mathematical representations, and translate mathematical representations into problem situations.
- Understand and apply distinctions between exactness and approximation, precision and accuracy, and tolerance.
- Show proficient use of graphing calculators to explore mathematical concepts and solve problems (e.g., lists, tables, graphs, and iterations).

Generate adequate written explanations that show solutions with supporting information.

- Use math vocabulary to explain and support answers.
- Read and understand a wide range of math vocabulary and apply it to new situations
- Make logical (sometimes informal) arguments.
- Find illogical steps in arguments of others.
- Produce understandable explanations.
- Includes appropriate representations of information to aid explanation.
- Make reasonable responses that are clearly and concisely organized using charts, graphs, and tables to communicate strategies and solutions.

Generate examples and counterexamples of mathematical ideas.

- Produce and analyze examples.
- Show a limited ability to evaluate correctness of answers to non-routine problems.
- Demonstrate a partial understanding and use of mathematical, symbolic language to solve problems and communicate solutions.
- Show ability to make connections between classroom knowledge and real-world contexts with assistance.

Exceeds Level

Student who scored at the “Exceeds” level demonstrated grade-level appropriate ability to apply integrated procedural knowledge and conceptual understanding to complex and non-routine real-world problems that reflect the mathematical content in the Michigan Curriculum Framework. Such evidence was exhibited by, but was not limited to, students:

Apply concepts, algorithms, properties, and procedures to solve multi-step, non-routine problems.

- Demonstrate thorough understanding of rational and irrational numbers.

- Apply fluent computation with real numbers with minimal errors.
- Produce and explain/justify strategies to solve multi-step problems (non-routine also).
- Reflect and synthesize concepts of algebra, geometry, probability and discrete math.
- Apply independently mathematical concepts to new situations and problems without prompting from others.
- Use models to predict, evaluate predictions and adjust predictions/models based on results.
- Understand and use combination and permutation formulas.
- Understand and use sequence and series formulas.
- Apply knowledge of function families to generate real-world mathematical models.
- Prove the generalizations of arithmetic/geometric sequences.
- Design experiments to collect data.
- Recognize which properties of geometric figures are preserved under a transformation.
- Understand the effects on a graph of changing the parameters of the equation (e.g., $y = 2x$, $y = 2x + 4$; $y = x$, $y = 3x$)

Use appropriate tools (such as tables, charts, graphs compasses, protractors, and /or formulas) to obtain, interpret and apply mathematical information to complex situations.

- Select and use complex formulas.
- Develop and derive formulas.
- Analyze and interpret complex data.
- Determine lines of best fit and its equation for a data distribution.
- Generalize results from a sample to the population.
- Show proficient use of graphing calculators including programming to solve problems.

Generate and justify conclusion by providing accurate, concisely written responses to mathematical questions.

- Use mathematical vocabulary spontaneously, naturally, and accurately.
- Incorporate vocabulary in explanations.
- Demonstrate that mathematical definitions are the foundation of rigorous mathematical proofs.
- Verify solutions and extend strategies to other situations.
- Creates methods and tools to clarify and extend explanations.

Generalize from examples, extend examples and generate counterexamples.

- Compare and evaluate various strategies for clarity and efficiency.
- Demonstrate proficient understanding and use of mathematical, symbolic language to solve problems and communicate solutions.
- Extend patterns and examples beyond the obvious.
- Show ability to make connections between classroom knowledge and real-world contexts.